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**working paper  
department  
of economics**

PUBLIC AND PRIVATE RESPONSIBILITIES IN  
ON-THE-JOB TRAINING OF  
DISADVANTAGED WORKERS

BY

MICHAEL J. PIORE

Number 23 -- June 1968

**massachusetts  
institute of  
technology**

**50 memorial drive  
cambridge, mass. 02139**

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RANKING OF TARIFFS UNDER MONOPOLY POWER IN TRADE

by

Jagdish N. Bhagwati and Murray C. Kemp

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The views expressed in this paper are the authors' responsibility, and do not reflect those of the Department of Economics, nor of the Massachusetts Institute of Technology.

## RANKING OF TARIFFS UNDER MONOPOLY POWER IN TRADE

By Jagdish N. Bhagwati and Murray C. Kemp

Kemp [3] has argued that, for a country with no monopoly power in trade, a lower tariff is preferable to a higher tariff, in the sense that any distribution of individual utilities attainable with a higher tariff is attainable with a lower tariff, usually with something to spare. Subsequently, Vanek [5] and Bhagwati [1] showed that if exportables are inferior (a) competitive equilibrium may not be unique, (b) one of the low-tariff equilibria may be inferior to one of the high-tariff equilibria and, therefore, (c) a reduction in the tariff might leave a country worse off. As a result [1] [4] [5], Kemp's proposition has now been elaborated to read: "the (best) utility possibility curve under a lower tariff will indeed lie outside that under a higher tariff, regardless of the inferiority of the exportable good in social consumption; but a competitive price system could well result in equilibria involving a higher welfare level under a higher tariff, unless inferiority of the exportable good in social consumption were ruled out." [1]

Can anything be said about the ranking of tariffs when a country has monopoly power in trade? Or must one be content to know that an optimal tariff exists? This note shows that, under very modest restrictions on preferences and in spite of the necessity of ranking sub-optimal policies, it is possible to establish the following propositions. Let the optimum tariff be  $t_w$ , the zero tariff  $t_0$  and the (just) prohibitive tariff  $t_p$ .

Proposition (1): Successive increases in the tariff from the level  $t_0$  will raise welfare until the level  $t_w$  is reached; successive increases in

in the tariff thereafter will reduce welfare until the level  $t_p$  is reached; higher tariffs merely involve continuing autarky and hence are partially ordered.

Proposition (2): For a country with monopoly power in trade, therefore, the choice of a social welfare function will merely determine the magnitudes of  $t_w$  and  $t_p$ ; hence one could regard tariffs as continuously laid in a chain from zero to infinity, with the social welfare function (for a specific country) serving, as it were, as a spike which lifts this chain up to the level of the optimal tariff and drops it to the floor at the level of the (appropriate) prohibitive tariff--as illustrated by Figure (1) for five hypothetical welfare functions.

These propositions are not generally valid. To establish the conditions under which they are valid, consider Figure (2), which shows the trade-indifference curves  $U_w^I$ ,  $U_o^I$  and  $U_p^I$  reached by country I successively under an optimum tariff, a zero tariff and a prohibitive tariff. It is clear that Proposition (1), and hence Proposition (2), will hold if and only if an increase in country I's tariff will necessarily reduce the demand for imports. For, in such a case, an increase in the tariff, starting from a zero tariff at  $R_o$ , will take the economy through higher and higher trade indifference curves until it reaches  $R^*$  and then through successively lower trade-indifference curves to 0 and  $U_p^I$ .

Therefore, exceptions to Proposition (1), and hence Proposition (2), must constitute exceptions to the rule that an increase in the tariff will reduce the demand for imports. It can then be shown that this rule admits of exceptions only when the exportable commodity is inferior.<sup>1</sup>

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<sup>1</sup>Note, therefore, that the argument sometimes made in balance of payments theory, that tariffs must be preferred to devaluation until the optimum tariff is reached, is valid only insofar as inferiority of the exportable good is ruled out.



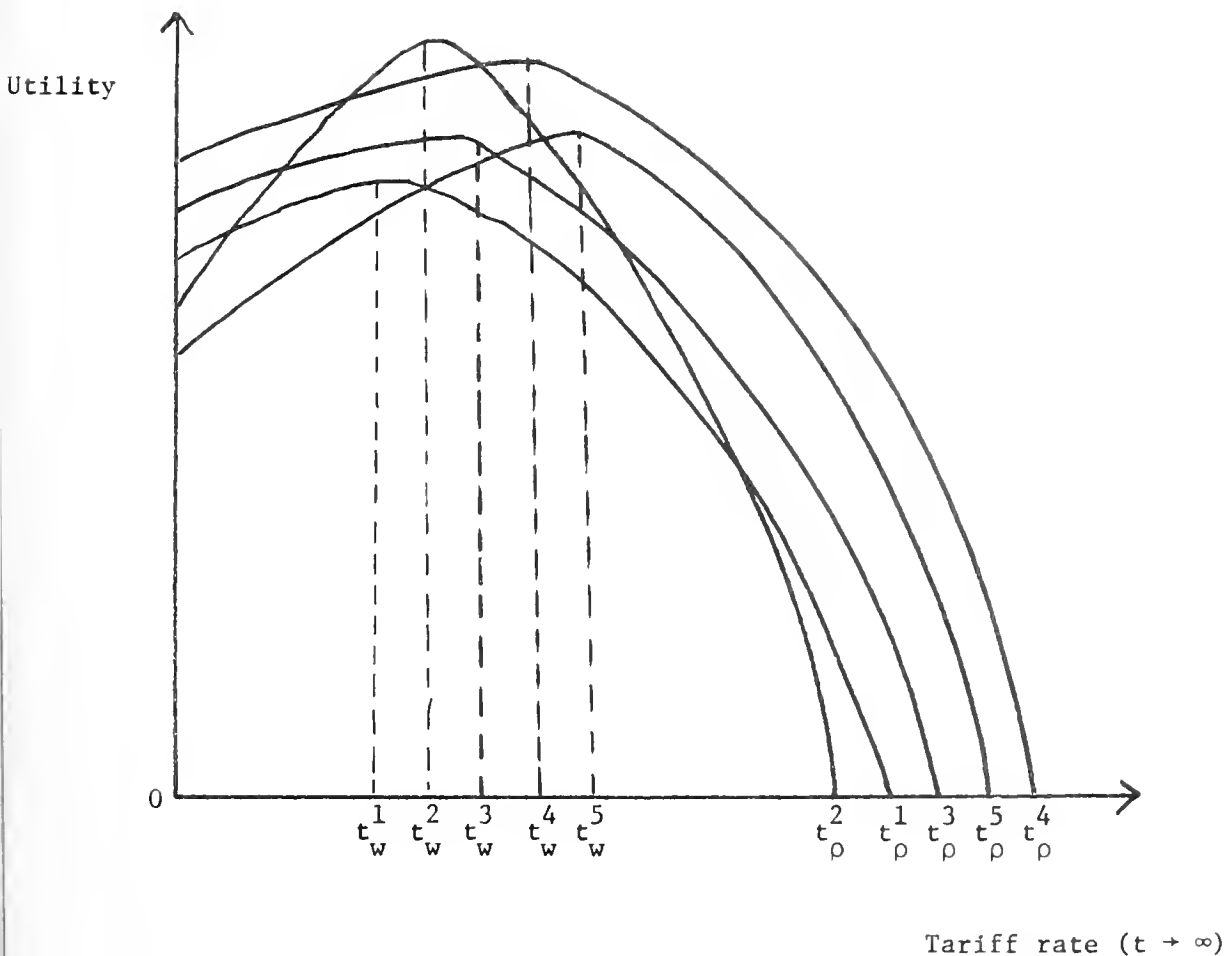


Figure (1)\*

\*Tariff-ranking for a given country, with monopoly power in trade, under five alternative social welfare functions. Note that no cardinal significance is to be attached to the utility axis. The figure merely ranks, in terms of utility, tariffs ranging from zero to infinity for each social welfare function. It also shows the optimum tariffs, for each of the five functions, at  $t_w^5$ ,  $t_w^4$ ,  $t_w^3$ ,  $t_w^2$ ,  $t_w^1$  and the corresponding prohibitive tariff levels at  $t_\rho^5$ ,  $t_\rho^4$ ,  $t_\rho^3$ ,  $t_\rho^2$ , and  $t_\rho^1$ .

The diagram could be readily extended to the second and third quadrants, to show the effects and ranking of export subsidies.

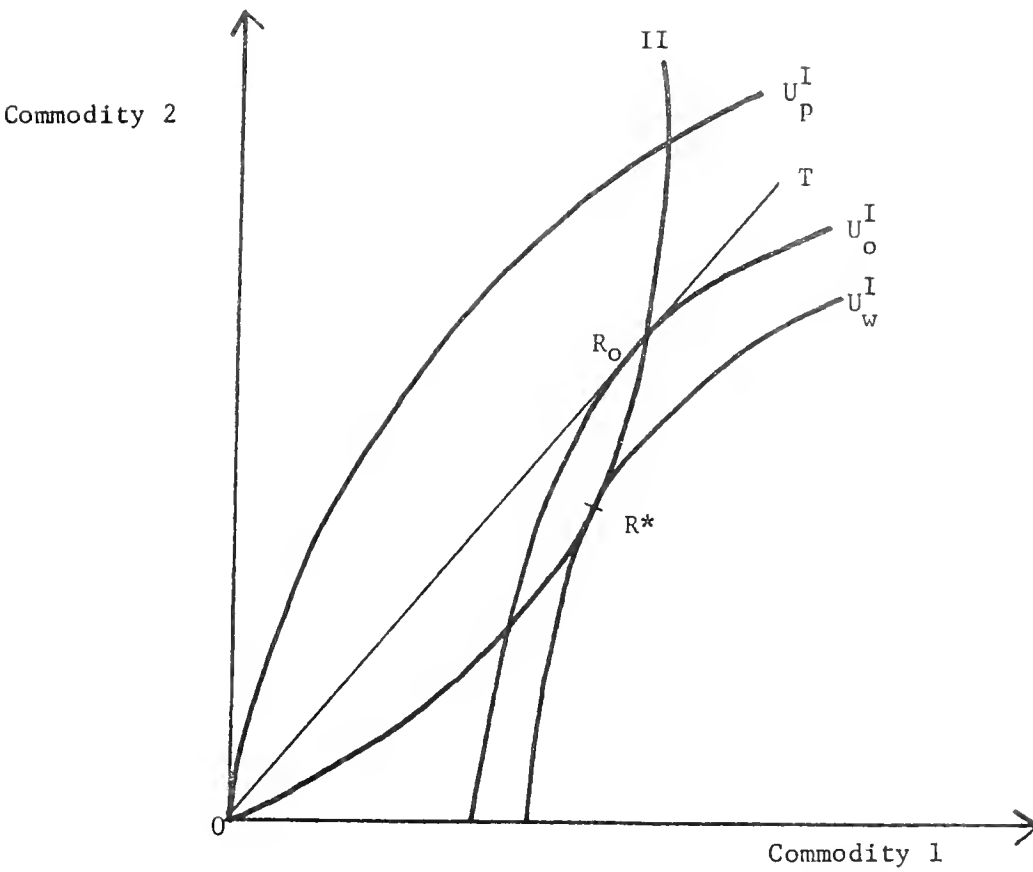


Figure (2)\*

\*The figure shows the optimum-tariff welfare level  $U_w^I$ , the zero-tariff welfare level  $U_o^I$  and the self-sufficiency welfare level  $U_p^I$  for country I, the free-trade terms of trade OT and country II's offer curve OII.

Hold the terms of trade constant at unity. Suppose that Commodity 1 is imported and that Commodity 2 is the numéraire. The internal price ratio is, therefore,  $(1 + t)$  where  $t$  is the rate of duty. The demand for imports is  $E_1(1 + t, I_2)$  where

$$I_2 = (1 + t)X_1 + X_2 + tE_1$$

is income in terms of the numéraire commodity,  $X_1$  is the output of good 1 and  $tE_1$  is the tariff revenue. We have

$$\frac{dE_1}{dt} = \frac{\partial E_1}{\partial t} + \frac{\partial E_1}{\partial I_2} \frac{dI_2}{dt}$$

$$\frac{dI_2}{dt} = X_1 + E_1 + t \frac{dE_1}{dt}$$

Hence

$$\begin{aligned} \frac{dE_1}{dt} &= \frac{\partial E_1}{\partial t} + \frac{m_1}{1+t} (X_1 + E_1 + t \frac{dE_1}{dt}) \\ &= \frac{\frac{\partial E_1}{\partial t} + \frac{m_1}{1+t} D_1}{1 - \frac{t}{1+t} m_1} \end{aligned}$$

where  $m_1$  is the marginal propensity to consume the first or imported commodity and  $D_1$  is consumption of the first commodity. Introducing the Slutsky decomposition,  $\frac{\partial E_1}{\partial t} = \frac{\partial E_1}{\partial t} \Big| - \frac{m_1}{1+t} D_1$ , where  $\frac{\partial E_1}{\partial t} \Big|$  is the pure substitution slope, we obtain, finally,

$$\frac{dE_1}{dt} = \frac{\frac{\partial E_1}{\partial t} \Big|}{1 - \frac{t}{1+t} m_1}$$

which is negative unless the export is very inferior.

Figure (3) illustrates the possibility, ruled out by our restrictions on consumption inferiority, that an increase in the rate of duty may give rise both to an increase in import demand and to a deterioration in the terms of trade of the tariff-imposing country. With the lower tariff, production takes place at P, consumption at C, and the terms of trade are indicated by the slope of PC. With the higher rate of duty, production takes place at P', consumption at C'; and the (worsened) terms of trade are indicated by the slope of P'C'.

We have already stated that the possibility illustrated by Figure (3) can be ruled out if very modest restrictions are imposed on the community's preferences. We now offer two observations designed to emphasize just how modest those restrictions are.<sup>2</sup> First, we recall that "...the reciprocal demand curve traced out by a higher tariff rate will always lie inside the curve traced out by a lower tariff rate...." ([3], p. 34, n. 7). It follows that the possibility illustrated by Figure (3) requires offer curves which yield multiple equilibria at given terms of trade, as in Figure (4). [Points W and W' of Figure (4) correspond respectively to points C and C' of Figure (3)]. Second, it follows from our mathematical analysis that  $dE_1/dt$  is positive if and only if  $1 - [tm_1/(1+t)]$  is negative, that is, if and only if

$$1 + t(1 - m_1) < 0$$

As Kemp [4] has shown, however, this is precisely the condition for market instability when the terms of trade are given.

Finally, we note that, even when an increase in the rate of duty is associated with a reduction in the demand for imports and a deterioration of the terms of trade, nevertheless there exists an alternative high-tariff

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<sup>2</sup>The first observation emerged from a long correspondence with Harry G. Johnson.

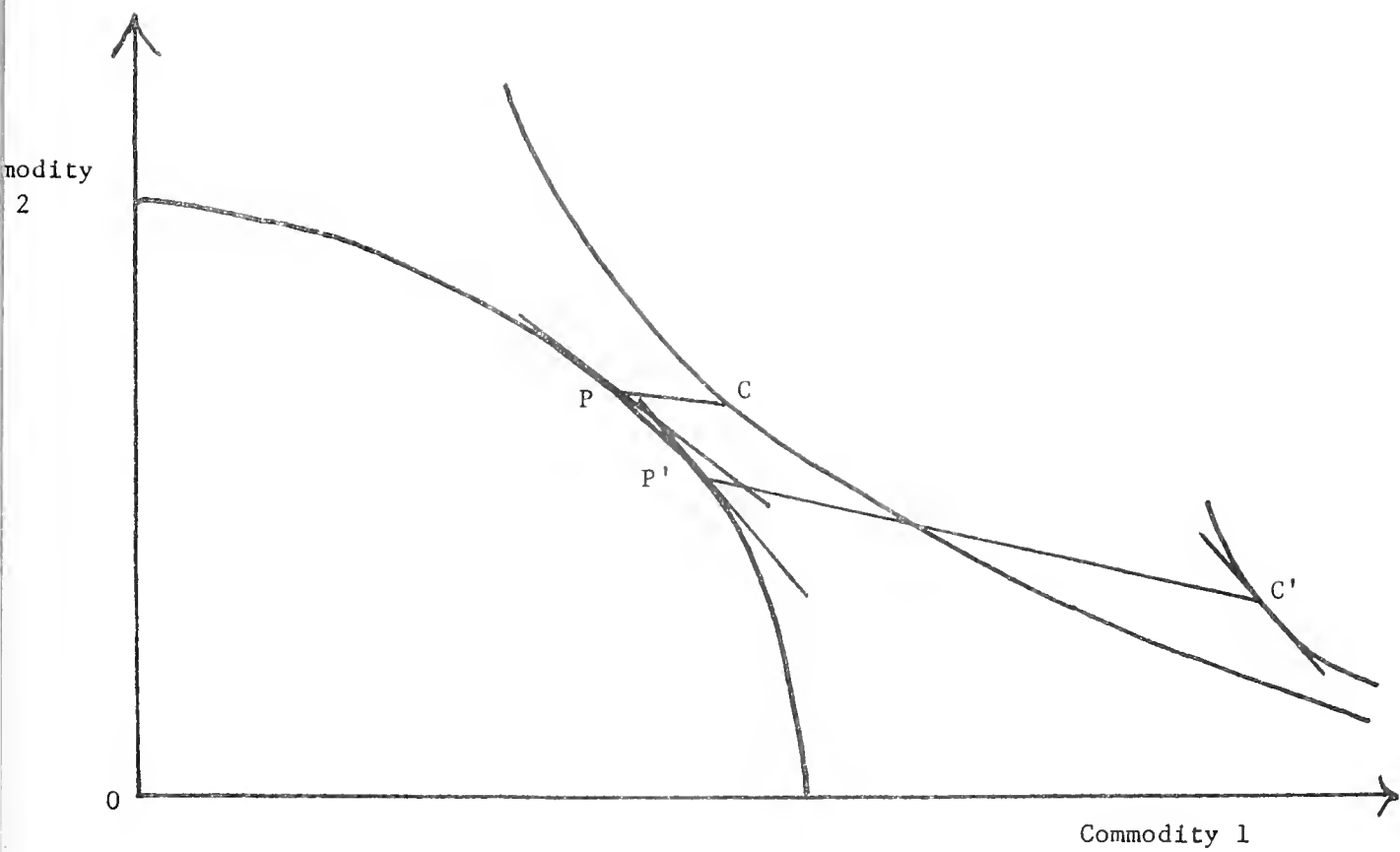


Figure (3)

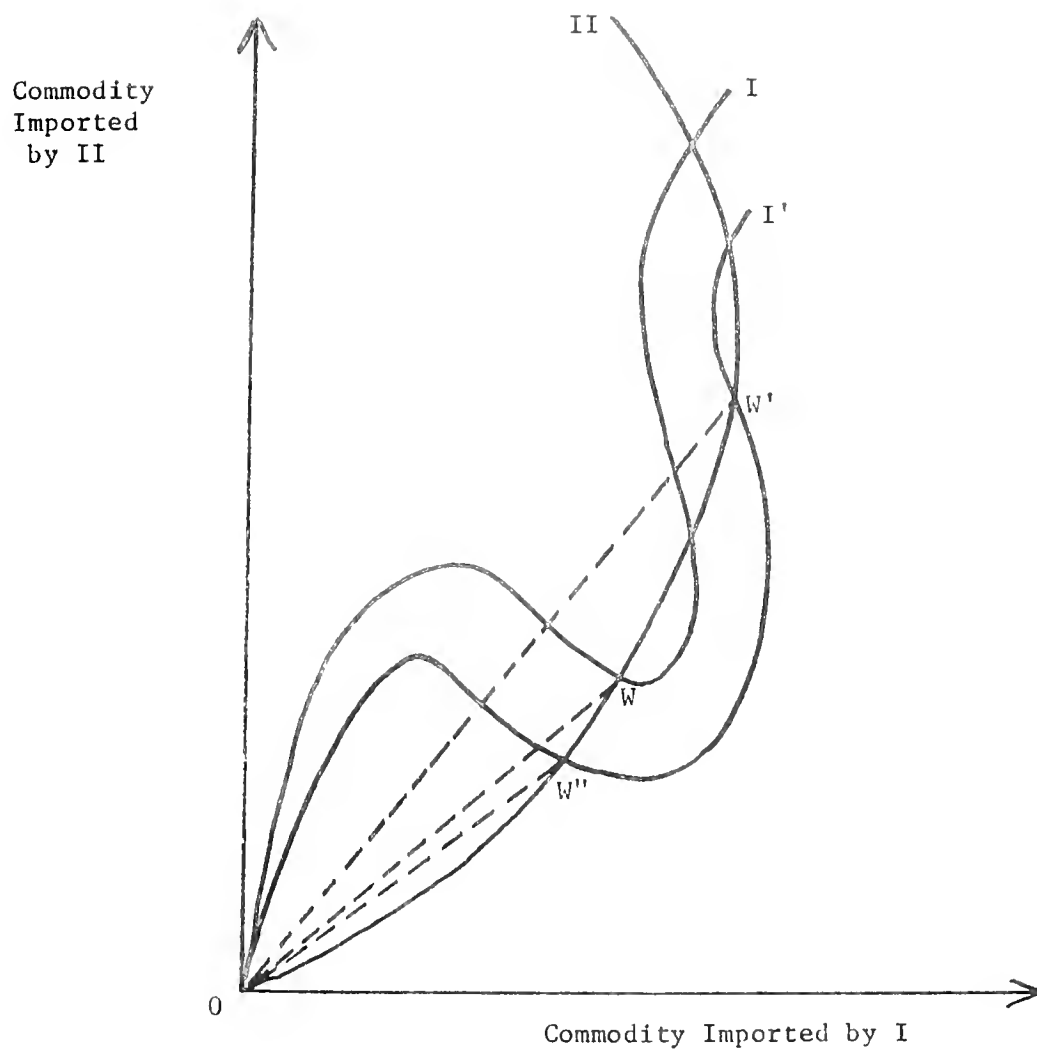


Figure (4)\*

- \* OI is the low-tariff offer curve of country I
- OI' is the high-tariff offer curve of country I
- OII is the offer curve of country II.

equilibrium characterized by reduced import demand and improved terms of trade [Point W" in Figure (4) illustrates.] It follows that by choosing carefully from alternative equilibria one can ensure that, as the rate of duty is raised, welfare rises steadily, reaches a maximum, then declines until the duty is prohibitive.

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